In the claims:

Please rewrite claim 15 as follows:

Sub Cl

15. (**Amended**) An electroluminescent device comprising:

an anode,

an organic hole injecting and transporting zone,

an organic electron injecting and transporting Zone;

B9

a cathode and

a luminescent layer of tris(8-quinolinolato)aluminum(III) (Alq3), wherein said compound is substituted in the 3- or 4-position with an electron-donor group and simultaneously substituted in said 5-position with an electron-acceptor or a p-delocalizing group.

REMARKS

Applicants and the undersigned are most grateful for the time and effort accorded the instant application by the Examiner. The Office is respectfully requested to reconsider the rejections presented in the outstanding Office Action in light of the following remarks. Attached hereto is a marked-up version of the changes made to the specification by the current amendment. Applicant intends no change in scope of the claims by the changes made by this amendment and has introduced no new matter to the specification.

The Claimed Invention

The claimed invention provides and improved Alq3 derivatives for use in organic light emitting devices (OLEDs). The claimed compositions provide improved intrinsic luminescent yield by providing "using an electron-donor group (R^{py}) in the 3- or 4-position and, at the same time, an electron-acceptor or p-delocalizing group (R^{ph}) in the 5-position." Specification, page 7, lines 9-11. Moreover, the claimed Alq3 derivatives have "a larger intrinsic luminescence yield with a calculated enhancement factor up to four [to yield a] device [with] a larger quantum efficiency than any other device made by unsubstituted and undoped Alq3. Specification, page 8, lines 13-15.

The Objection to the Drawing

The drawing is objected to in view of 37 C.F.R. 1.83(a). The subject of Figure 1, namely the molecular diagram of Alq3 labeled with standard notation, has been incorporated into the specification. The specification and claims have been amended to reflect this change. The diagram is now referred to as Formula I. No new matter has been introduced by this amendment as the substance of Figure 1 was simply placed on page 6 of the specification and given a generic name. This amendment is not in acquiescence of the Examiner's position that the "drawings must show every feature of the invention specified in the claims" (Office Action, page 2, lines 10-11) but merely to expedite prosecution.

The 35 USC § 112 Rejection

Claims 15-22 stand rejected under 35 U.S.C. 112, second paragraph, as indefinite for use of the term "zone" in claims 15 and 19. Reconsideration and withdrawal of the

present rejection is hereby respectfully requested. Use of the term "zone" with respect to components of an electroluminescent device is well known in the art and thus not indefinite. See, for instance US Patent No. 4,885,211 (hereafter "Tang") where claim 1 recites "[a]n electroluminescent device comprising in sequence, an anode, an organic hole transporting zone, an organic electron transporting zone, and a cathode...." (emphasis added, Column 24, lines 22-23).

The 35 USC § 103(a) Rejections

Claims 1-14 stand rejected under 35 U.S.C. 103(a) in view of Tang in view of Moore et al. (hereafter "Moore"). Claims 15-22 also stand rejected under 35 U.S.C. 103(a) in view of Tang and Moore as applied to Claims 1-14 and further in view of the statement in the written description (Page 8, lines 4-10) that the organic EL device could have two or three layers in addition to the electrodes. Claims 1, 8, 15 and 19 are independent claims; the remaining claims are dependent claims. Reconsideration and withdrawal of the present rejections are hereby respectfully requested.

A 35 U.S.C. 103(a) rejection requires that the combined cited references provide both the motivation to combine the references and an expectation of success. Not only is there no motivation to combine the references, no expectation of success, but actually combining the references would not produce the claimed invention. Thus, the claimed invention is patentable over the combined references and the state of the art.

The Examiner has admitted that neither of these references describe the invention but claims that combination of these teachings would be obvious to a person skilled in the art. This is not supported by the references. The rejection fails to take into account the

absence of the claimed composition in either reference. In the absence of the composition, there can be no expectation of the results obtained, that of larger quantum efficiency in the absence of substitutions and dopants.

Tang discloses electroluminescent devices and generally describes the components of such devices. The Examiner summarizes this correctly and, also correctly, acknowledges that "Tang does not disclose that Alq3 is substituted in 3- or 4- position with electron-donor group and in 5-positions simultaneously with an electron-acceptor or p-delocalizing group." (Office Action page 4, lines 1-3).

Moore discloses mixed ligand aluminum chelates for use in electroluminescent devices. However, the Examiner's characterization of Moore as "teach[ing] the use of substituted aluminum chelate compound in an EL device" (Office Action, page 4, lines 4 and5) is insufficient on its face to establish a 35 U.S.C 103(a) rejection. The fact is that Moore discloses a large variety of substituents each of which can be placed at one or more of 6 positions and each of which may or may not be electron-donating or electron-accepting and any of which can be used in an electroluminescent device. Moore thus does not provide a teaching or suggestion of the instantly claimed composition. Combination of Moore and Tang fails to teach or suggest the instantly claimed invention.

The instantly claimed invention requires specific substitutions of a very specific nature; only electron-donating substituents at either position 3 or 4 and only electron-accepting substituents at position 5. These specific restrictions are not provided by Moore. In addition, the Moore compositions are physically different from those of the claimed invention. For instance, column 3, lines 56-60 read:

> The advantage of employing an aluminum chelate with one or two substituted 8-quinolinolato ligand(s) and one or two ligand(s) which are not substituted 8 quinolinolato ligands is that all of the potential physical properties of tris(8-quinolinolato)aluminum(III) chelates are attained. (emphasis added).

Clearly, a mixture of substituted ligands and unsubstituted ligands is not the same as the instantly claimed compounds and could not be expected to provide the same material properties of the claimed invention.

Moreover, the product produced by the Moore patent would not result in the instantly claimed invention. This is essentially acknowledged by the Examiner in the statement that Moore 'teaches' "substitutes may be made in all six positions including 3-, 4- and 5-positions of the quinoline ring." Office Action page 4, lines 5-6. The instantly claimed invention does not allow for substituents at all positions and only allows for and requires specific substituents at specific positions. Moore does not teach or disclose these limitations. In discussing placement of substituents, Moore simply states:

> Substituents at the 4, 5 and 6 ring positions are not favorably located to hinder sterically or otherwise impair the bonding of three 8-quinolinolato nuclei to a single aluminum atom, while it is contemplated that large substituents at the 3 or 7 ring positions could sufficient steric hindrance. On the other hand, the 2 ring position is suited to provide hindrance (e.g., steric hindrance), and even a very small substituent (e.g., a methyl group) in this ring positions can provide an effective blocking substituent. For synthetic convenience it is specifically preferred that steric blocking substituents be located in the 2 ring positions. As employed herein the 'steric blocking' is employed to indicate that the $(R^S)_m$-Q ligand will normally not coordinate effectively for inclusion as the third ligand of the aluminum atom. Column 6, lines 45-58.

The Examiner's assertion that "Moore lists the possible substituents as electron donating and accepting substituents, such as CH_3, $-CF_3$, $-OCH_3$, $-OCH_2H_5$" (Office Action, page 4, lines 14-16) is an over-simplification. The Examiner simplifies Moore as teaching only a few substituents among which can be found those of the claimed invention. Even if these were the only substituents cited by Moore, the rejection would still fail for lack of teaching of the specific placement and type of substituent. However, Moore discloses, in one table alone, not the **4** substituents mentioned by the Examiner, but **194** substituents. Any of these substituents could be used at any of the 6 positions yielding 194^6 possibilities. Thus the possible permutations are 53,310,208,315,456. Which of these many possible choices would result in the compositions of the instantly claimed invention?

Moore addresses electron-donating and electron-accepting substituents separately and makes no suggestion to combine these in one composition. Even if such a combination could be tried, Moore provides no teaching as to the critical placement of the substituents. Thus, even though Moore mentions the use of electron-donating substituents effect hue, it is "[a]lthough steric hindrance is entirely independent of electron donating or accepting properties and, thus, R^2 can take the form of either an electron donating or accepting group, it is preferred to choose R^2 from among electron donating groups. By adding a second electron-donating group R^4 a further blue shift in peak emission wavelength is achieved. R^3, when present, can take any synthetically convenient form, but is preferably also electron donating." Column 7, lines 6-13. Thus,

following Moore, if an electron-donor substituent were used, it would be placed at the 2 position. This does not teach or suggest the claimed invention.

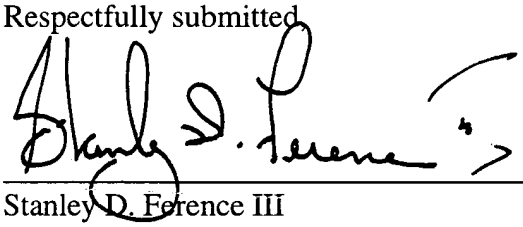
Electron-acceptor substituents are discussed separately by Moore. No mention is made of the combination in one molecule, no suggestion is made to do so or to any enhanced properties that might result. In addition to the absence of suggesting simultaneously combining electron-donor and electron-acceptor substituents, the necessary placement of these substituents is not provided. In fact, according to Moore, "electron accepting substituents on the benzo ring component of the quinoline nucleus shift the hue of emission to shorter wavelengths. Thus, any or all of the substituents at the 5, 6 and 7 quinoline ring positions, when present, are preferably electron accepting." Column 7, lines 14-18. Thus, if electron-acceptor substituents are used, they can be at any or all of the 6 positions with a potential narrowing to one or all of 3 positions. This does not teach or suggest the required presence of the electron-acceptor substituent at position 5 and certainly does not teach the simultaneous presence of the electron-acceptor substituent at position 3 or 4.

Combining Tang and Moore then would result in an electroluminescent device with a luminescent layer containing unsubstituted Alq3 and at least one of 53×10^{12} substituted Alq3 compositions. Even if there were a motivation for the combination, this combination does not teach or suggest the claimed invention.

Likewise, the rejection over Tang, Moore and the acknowledgment that electroluminescent devices can have multiple layers fails to establish unpatentability. Multiple layers of the wrong components would not yield the instantly claimed invention.

In view of the foregoing, it is respectfully submitted that Claims 1, 8, 15 and 19 fully distinguish over the applied art and are thus in condition for allowance. By virtue of dependence from what is believed to be allowable independent Claims 1, 8, 15 and 19, it is respectfully submitted that Claims 2-7, 9-14, 16-18 and 20-22 are also presently allowable.

Respectfully submitted,



Stanley D. Ference III
Registration No. 33,879

FERENCE & ASSOCIATES
129 Oakhurst Road
Pittsburgh, Pennsylvania 15215
(412) 781-7386
(412) 781-8390 - Facsimile

Attorneys for Applicants

MARKED-UP VERSION OF CLAIM AMENDMENTS

The paragraph beginning at Page 6, Line 1, is rewritten as follows:

--For a better understanding of the present invention, together with other and further features and advantages thereof, reference is made to the following description, [taken in conjunction with the accompanying drawings,] and the scope of the invention will be pointed out in the appended claims.--

The paragraph beginning at Page 6, Line 6, is rewritten as follows:

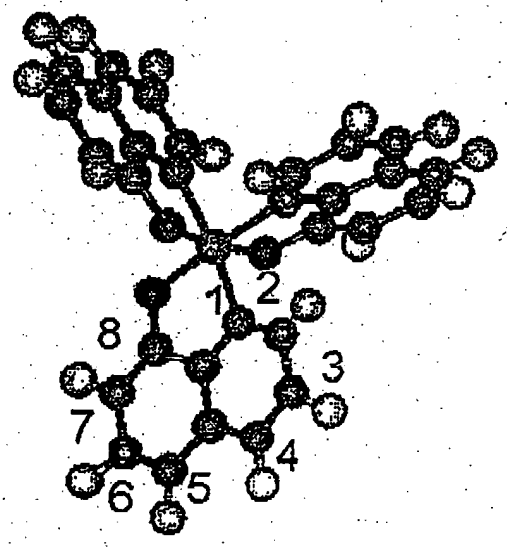
-- **[Brief Description of the Drawings**

Figure 1 illustrates the formula of an Alq3 where the atoms on the quinolinolato ligand are labeled with standard notation.] --

The paragraph beginning at Page 6, Line 13, is rewritten as follows:

-- [Referring now to Figure 1, the formula of] Formula 1 shows Alq3 [is shown] and the location of the atoms on the quinolinolato ligand labeled with the standard notation.

Formula I



--

Claim 15 is rewritten as follows:

-- 15. **(Amended)** An electroluminescent device comprising:

an anode,

an organic hole injecting and transporting zone,

an organic electron injection and transporting Zone;

a cathode and

a luminescent layer of [the compound shown in Figure 1] tris(8-quinolinolato)aluminum(III) (Alq3), wherein said compound is substituted in the 3- or 4-position with an electron-donor group and simultaneously substituted in said 5-position with an electron-acceptor or a p-delocalizing group.